THE ASSOCIATION BETWEEN IRON DEFICIENCY ANEMIA AND CHRONIC DIARRHEA IN CHILDREN between 2 months - 2 years of age

Athesis Submitted to the Department
of Pediatrics As Partial Fulfillment of
Requirements
for the Diploma in Child Health
(D. C. H.)
By

Dr. Fawzia Abed Hussain
M. B. Ch. B.

2004

بسم الله الرحمن الرحيم

وقل ربي زدني علماً

صدق الله العظيم

DEDICATION

- To my Parents because they do a lot for me .

- To my teachers .

Acknowledgment

I would like to express sincere and thanks gratefulness to my supervisor senior lecturer Dr. Yahya H-Ethawi for choosing this subject and for his supporting ,advice in preparing this study and over coming the great difficulties in this respect .

Iam grateful to every one who shared in any type of help to accomplish this study .

Dr. Fawzia Abed Hussain

Contents

Aim of study

This study was done to see the relation between diarrhea and anemia and growth parameters.

Summary

A study conducted in the central teaching hospital for the children where 70 children aged between 2 months – 2 years during 4 months period from 10th of January 2004 to 10th of may 2004 included in this study. Of these children, (40) admitted to the hospital because of diarrhea fo more than 2 weeks, and (30) children visit the hospital foe vaccination as control.

Hemoglobin, PCV, length , weight , head circumference were taken. History of previous attacks of diarrhea recurrence, any associated illnesses, type of feeding any added food to see if there is any relationship between chronic diarrhea and iron deficiency anemia and their relationship with growth parameters.

Patient total no. (70) , (40) male, (30) female.

The study show that (70 %) of patient with diarrhea were anemic with mild anemia (Hb 7-11).

Also 72.5 % of patient with diarrhea is were bottle fed. (10%) mixed feeding, while 43.3% of control were breast feed, (16.6 %) were mixed feeding.

So most patients with chronic diarrhea were bottle fed, and they from high percentage of anemic patient due to chronic diarrhea.

In addition to the above 25 % patients with diarrhea were < 3d centile in all parameters, while only 3 % of control < 3rd centile in all parameters.

In this study we exclude patient < 2 months for the possibility of inborn error of metabolism as a cause of chronic diarrhea and exclude any chronic illnesses.

Introduction:

Hemoglobin (Hb) : Is essential for life by which tissue receive a constant supply of O_2.The evolutionary development of O_2 carrying protein, the hemoglobin ,the ability of blood to transport O_2 and return Co_2 from the cells to the lungs (1).

Furthermore, the combination of O_2 with hemoglobin and its dissociation feom it are accomplished without expenditure of metabolic energy (2) .

Hemoglobin is a complex protein consisting of iron containing heme groups and the protein moiety (globin) .

A dynamic interaction between heme and globin gives the hemoglobin its unique propertics in the reversible transport of O_2 (2,3) .

The hemoglobin molecule is a tetramer made up of two pair s polypeptide chains, each chain having a heme group attached . The polypeptide chains of various Hb are of chemically different types (2) .

The major Hb of normal adult (HbA) is made up of one pair of α and one pair of B polypeptide chains represented as $(\alpha_2\beta_2)$.

The major Hb in the fetus (Hbf) is represented by $(\alpha_2\gamma_2)$. The various globin chains differ in both the number and sequence of amino acid and their synthesis is directed by separate genes (2) .

Two sets of genes for the chains are located on human chromosome 16, two pairs of alleles provide the genetic information for the structure of the α chain, β, γ, δ genes are closely linked on chromosme 11.

Within the RBC_S (red blood cells) of an embryo , fetus child and adult, six different Hb may normally be detected :
(1) The embryonic Hb, (a) . Gower I, (b). Gower II , (c) . Portland (2). Fetal Hb, Hbf, (3). The adult Hb, HbA and HbA2 . the electro-phoretic mobilities of Hb vary with their chemical structure .

The time of appearance and quantitive relationship among the Hb are determined by complex developmental processes (2). Iron, folic acid and vitamin B_{12} play an important role in the production of RBCs.

Iron ; is a constituent of Hb, which accounts for about 75% of this element in the body .

The body have an iron store . The women needs more of these mineral during pregnancy and lactation.

Directly increase of iron during lactation (in the diet) does not seem to the amount in the milk , possibly because of the way the body controls their absorption and blood levels (3) .

Anaemia

Anamia in most instantces defines as a reduction in RBC mass below normal limits . Its measured by measuring the number of RBC, a volum of packed red blood cells (hematocrit)) or the reduction in Hb% concentration (3) .

For infrants , Hb of 11 gm/dl is the cut – off point between anaemia and normal Hb(3) .

There may be racial differences in Hb levels . Black children have levels about 0.5 g/dl lower than those of white and Asian children of comparable age and socioeconomic status, possibly in part, because of the high incidenc of. α – thalessemia in black (2) .

Although a reduction in the amount of circulating Hb, the O_2- carrying capacity of the blood, few clinical disturbances occur until the Hb level falls below 7-8 g/dl (2).

Anemia is always a manifestation of disease or nutritional deficiency (4) .

Iron deficiency is the commonest aetiologic Factor in anemia throughout the world (5) .

Iron

Iron present in HB, myoglobin & other iron containing enzymes (cytochroms, cytooxidase, peroxidase, catalase)

Bioavailability: 30% in animal products, 10% plant products, 50% human milk, absorption enhanced by vitC, citric, malic and tartaric acid, fructose, sorbitol, alcohol and amino acids. Absorption inhibited by: phytate, protein, Ca, Mu, Cu, Cd, Co. (6).

The body of a newborn infant contains about 0.5g of iron where as the adult content is estimated at 5g. To make up for this discrepancy, an average of 0.8 mg of iron must be absorbed each day during the 1st 15yr of life. In addition to this growth requirement, a small amount is necessary to balance normal losses of iron by shedding of cells. Accordingly to maintain +ve iron balance in childhood, about 1mg of iron must be absorbed each day. (2).

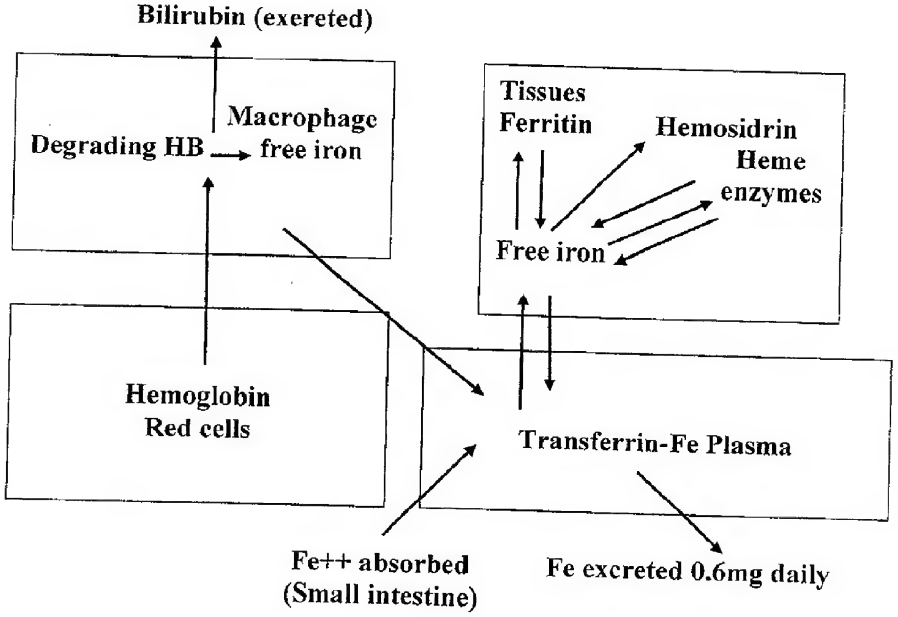
Dietary Sources

Iron is found in the liver, meat, eggyolk, green leafy, vegetable, spinach, peas, direct fruit and fortified formula (12mg/L) Iron is absorbed best from meat and least well from vegetables. Both human milk un supplemented cow's milk are poor sources of iron (0.5-1.5mg/L), but iron is absorbed 2-3 times more sufficiently from human milk than from cow's milk, probably due to lower Ca^{++} contents of breast milk and high concentration of iron binding protein "lactoferrin". (2).

Iron metabolism

The total quantity of iron in the body average (4-5) gm, about 65% of which in the form of HB., about 4% is in the form of myoglobin, 1% is in the form of various heme compound that promot intracellular oxidation, 0.1% combined with the protein transferrin in blood plasma, and 15-30% is stored mainly in the reticuloendothelial system and linear parenchymal cells, principally in the form of ferritin.(7).

Iron transport and metabolism (7)



Absorption of iron from GIT

1. Trace amount absorbed in the stomach .
2. Trace amount mainly proximal to midjeujenum (duodeuum and jeujenum) .
3. Abosorption capacity in the caudal intestinal segments .

This localization is partly related to such intraluminal factors as pH and redox potential . (8,9)

Regulation of total body iron by controlling rate of absorption and excretion

1. When body store has become saturated with iron so that essentially all the apoferritin in the iron storage areas is already combined with iron , the rate of absorption of iron from small intestine becomes greatly ↓. (7).
   On the other hand, when the iron stores has become depleted of iron, the rate of absorption can become accelerated probably to .
2. Five or more times as greater as when iron is regulated to a great extent by altering the rate of absorption . (7)
3. Trans ferrin about 20-45% saturated . Smaller amount of iron stored as hemosidrin which is exteremly insoluble . About 90% of intake excreted in the stool, which is relatively fixed . (7)
4. The body is unable to regulate its iron content effectively by excretion and normally can not get rid itself of any substantial amount of iron once it has been taken into the body beyond the stage of intestinal mucosal cell .
5. The amount of iron lost from the body per day is small between 0.5-1 mg under physiological conditions .

6. The rate of loss is relatively constant and is independent of intake occurring as a result of desquamation of epithelial cells, mainly from the alimentary tract from excretion in the urine and sweat and loss of hair and nails. Iron in the faces consists almost entirely of unabsorbed iron and desquamated mucosal cells (10).

Iron Deficiency Aneamia

Anemia resulting from lack of sufficient iron for synthesis of HB is the most common hematologic disease of infancy & childhood. (2).

When the supply of iron to the bone marrow falls short of that required for the production of red blood cells, anemia will ensue(5).

During 1st year of life because a relatively small quantities of iron rich foods are eaten, it is often difficult to attain sufficient iron for this reason, the diet should include such foods as infant cereals or formulas that have been fortified with iron, both of these are very effective in preventing iron deficiency anemia. (2)

Stages of iron deficiency

These can be divided into 3 stages:

1st stage: negative iron balance:
In which the demands for (or losses of) iron exceed the body's ability to absorb iron from the diet. (5)

2nd stage: iron deficient erythropoisis

When iron stores become depleted the serum iron begins to fall. Gradually, the TIBC, as do red cell protoporphyrins (5)

3rd stage: iron deficiency anemia

Etiology

The development of anemia is multifuctorial where by itself is a poor indicator of nutrient status . (11)

Etiology depend on one or more of the following factors :

1. ↑ Requirement
2. Dietary factors
3. Intestinal absorption
4. Blood loss

1. ↑ Requirement

Iron is a mineral, the body need in order to make red blood cells .

2. Dietary Factors

Anaemia is the commonest presenting nutritrional deficiency . (13) causes :

1. Breast Feeding for > 6 mo. without iron supplements .
2. Early solid food intake : breast milk looses much of its property of iron absorption enhancement when other food are given with it .
3. Early cow milk intake .
4. Other dietary factors include frequent tea intake, low as corbic a. and meat intake .

3. ↓ Intestial absorption

Occur in many clinical settings . (6)

4. Blood loss

1. Prenatal bleeding
2. Post natal bleeding

Clinical manifestation

1. Pallor is the most important sign of iron deficiency (2)
2. Skin thin and inelastic (3)

3. Pagophagia desire to ingest an unusual substance such as ice or dirt, or lead containing substance and it leads to plumbism. (2).
4. Iron deficiency also affects neurologic and intellectual function because it's important in number of enzymes and cofactors containing iron. (2).
5. When HB< 5g/dL → irritability and anorexia are prominent, tachycardia, cardiac dilation and "hemic" flow systolic murmur, blue eyes.
6. Prolonged iron deficiency anemia often associated with dry brittle and ridged nails which occasionally assume a concave surface (koilonychia).
7. The epithelium at the edge of the lips may be cracked (angular stomatitis) and the tongue may become atrophic and even tender (glossitis).
8. Splenomegally in 10-15% (2,5).

Laboratory Findings

1. Prior to development of anemia bone marrow hemosiderin disappear (2,5).
2. Serum ferritin become <15 mg/ml which is iron storage protein and accurate estimate of body iron stores in the absence of inflammatory disease. (2,5).
3. Next ↑ total iron binding capacity (TIBC). (2,5)
4. ↓ Transferrin saturation below normal. (2,5).
5. Then the RBC become smaller than normal and their HB content ↓ (2).
6. 1st abnormally in RBC morphology appear which is microcytosis, later hypochromia occur due to ↓ HB amount.
7. Elliptical cells, then piokilocytosis are also seen.
8. Some target cells also found but also can indicate other disorder. (14).
9. Morphologic characteristics of RBCs are best quantified by determination of MCH and MCV(2,5).

10. RDW > 17
11. Reticulocyte% usually normal but may be moderately ↑ in an acute episode of blood loss (5),white blood cells and platlets normal or ↑.
12. Bone narrow show moderate erythroid hyperplasia.
13. In about 1/3 of cases, occult blood can be detected in the stools , (2,5) .

Diffrential Diagnosis

Iron deficiency an anemia should be diffrentieted from other causes of hypochromic microcytic anemia like :

1. β and α thlassemia traits .
2. Hb H disease.
3. Anaemia of chronic disease (ACD) .
4. Lead poisoning.
5. Sideroblastic anaemia .

Differentiating Features of micro cytic Anemias

	IDA	β.thalassemia trait	ACD	Sideroblastic Anemia
- Serum iron	< 30	N/↑	< 50	N/↑
- TIBC	> 360	N	< 300	N
-Serum ferritin (ug/1)	< 15	50-300	30-200	50-300
-Redcell protoporphyrin	↑	N	↑	↑ /N
Hbpattern	N	Abnormal	N	N
- Smear	Micro/hypoch ·	Micro/ hypo · With targeting	Micro/hypo · or N	Variable

- IDA iron deficiency anemia
- N: normal
- ↑ : Increase
- ACD: anemia of chronic disease.
- TIBC: Total iron binding capacity
- Hypoc: hypochromic
- Micro: microcytic

The lead poisoning associated with iron deficiency the RBCs are morphologically similar but coarse basophilic stippling of the RBCs is frequently prominent, ↑ blood leads, FEP, and urinary coproporphyrin levels are seen. (2, 5).

Treatment

1. Iron deficiency anemia responds very effectively to iron therapy. (2,5).

   Among many iron preparations, ferrous sulfate taken by mouth is the simplest and preferable treatment for most patients. A daily total of 4-6 mg/kg of elemental iron in 3 divided doses provided an optimal amount of iron for the stimulated Bone-marrow to use. (2,5).

2. The family must be educated about patient's diet and milk consumption limited to 500ml (1 pint)/24hr or less. Parentral therapy rarely required, when iron absorbed poorly as in patients with proximal intestinal disease as in celiac disease. (2,5)
   Dose of iron dextran = desired rise in HB (g/dl) xwt(kg)x3.
3. Blood transfusion is indicated only when anemia is very sever or when superimposed infection interfere with response, blood transfusion given as packed RBCs, if HB<4g/dl, 2-3ml/kg packed RBC with furosemide. (2,5)

Diarrhea

Infections of the gastrointestinal tract are caused by wide variety of entropathogens including bacteria, viruses parasites. (2).

Clinical manifestations

Depend on the organism and host response to infection and include:

a. Asymptomatic infection.
b. Watery diarrhea.
c. Bloody diarrhea.
d. Chronic diarrhea.
e. Extraintestinal manifestations of infection

H_2o and electrolytes malabsorption lead to accelerated excretion of intestinal content. (2)

f. Severe diarrhea is debilitating and can be fatal especially in infants, large amount of Na^-, K^+, and H_2o are washed out of the colon and the small intestine causing dehydration, hypovolemia and eventually shock and cardiovascular system collapse (9, 15).

Etiology:

The two basic types of acute infectious diarrhea are inflammatory and non-inflammatory.

- Non inflammatory diarrhea: Entropathogens elicit non inflammatory diarrhea through entrotoxin production by some bacteria, destruction of the villous (surface) cells by viruses and adherence by parasites and or translocation by bacteria. (2).
- Inflammatory diarrhea: usually caused by bacteria those invade the intestine directly or produce cytotoxins.

Some entro-pathogens possess more than one virulence property (2).

* Acute diarrhea :

Diarrhea of short duration , may be associated with any of the recognized bacterial, virual or parastic causes of enteritis . (2)

* Chronic or Persistant diarrhea :

Lasting more than two weeks : (2)

* Other causes of diarrhea :

1. Feeding difficulty
2. Anatomic defects
3. Malabsorption
4. Endocrinopathies
5. Food poisoning
6. Neoplasms
7. Miscellaneous

Chronic diarrhea

Passage of four or more watery stools / day persisting for at least two weeks .

Whatever constant or intermittent may be functional symptomsor manifestation of serious illness (2,5,6) .

Chronic diarrhea should raise the possibility of Malabsorption (13) .

Sometimes difficult distinction between malabsorption and diarrhea of other causes . (16)

Common causes of chronic diarrhea during infancy and child-hood :

1. Infancy :

- Post gastroenteritis malabsorption syndrome
- Cow's milk / soy protein intolerance
- Secondary disaccharidase deficiencies
- Cystic fibrosis

2. Child hood

- Chronic non specific diarrhea
- Secondary disaccharidase deficiencies
- Giardiasis
- Post Gastroenteritis malabsorption Sydrome
- Celiac disease
- Cystic fibrosis (2)

Patho – physiology

The pathophysiologic mechanism of diarrhea include :

1-Osmotic diarrhea

Due to presence of an unabsorbable solutes in the GIT ⟶ Maldigstion and tansport defecet .

With ↑ osmolalilty of the stool due to acidic and reducing substances .

- Causes of osmotic diarrhea
  - Malabsorption of water – soluble nutrients .
  - Excessive intake of Carbonated fluid .
  - Excessive intake of non absorbable solutes . (2)

2-Secretory diarrhea :

Due to activation of intracelular mediators such as cyclic AMP,cyclic GMPand intracellular Ca^{++} ⟶ stimulated active Cl^- secretion ⟶ ↓ absorption , ↑ secretion.

- Causes of secretory diarrhea :
  - A ctivation of cyclic AMP : bacterial toxins, hormones.
  - Activation of cyclic GMP ,
  - Ca^{++} dependent . (2).

3-Mutational defects in ion transport proteins :

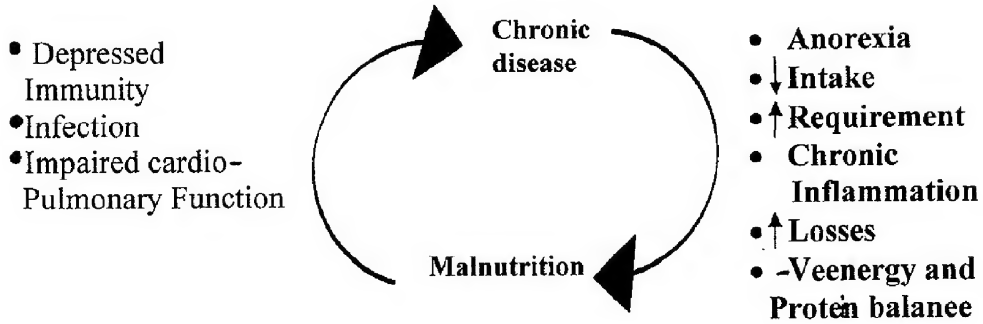
Congential defects of $Na^+ - H^+$ exchange , $Cl^- - HCO_3^-$ Exchange and Na^+ – bile acid transport proteins result in secrtory diarrhea present at birth and failure to thrive (Achloride diarrhea) .

4- Reduction in anatomic surface area :
Such as celiae disease which result inflattening of the proximal intestinal surface area with marked in digestive and absorptive function of the villus epithilium . (2)

5- Alteration in intestinal motility :
Hypomotility allowing bacterial over growth that leads to deconjugation of bile salts and in intracellular mediation cyclic AMP leading to secreatory diarrhea : (2)

Iron deficiency anemia in chronic diarrhea causes :

1. Chronic blood loss from the gut may complicate any ulcerative lesion in the intestinal tract and may also be afeature of haemorrhagic diathesis (6) .
   A children have been reported to develop significant blood loss from the gut as a reaction to cow's milk protein , chronic blood loss cause iron deficiency anemia . (6)
2. Impaired absorption of iron is common and lead to chronic anemia . (17)
3. Intestinal causes of malabsorption lead to severe iron deficiency anemia . (17)
4. Poor intake due to chronic diseases chronic ill health and anorexia also leads to iron deficiency anemia .



Management

1. Nutritional management of the infant and child with diarrheal disease aims to return the child to a normal diet as soon as possible and if there has been weight loss to ensure that dietary intake meet requirement for catch up growth . (2,6)
2. The single most effective strategy for preventing diarrhea in infancy remains breast feeding (6) .
3. Cereal based rehydration solution may bridge the gap between rehydration renourishment and soft cereals or vegetable based weaning foods are used beginning with around 75 Kcal/kg/day range to 150 Kcal/day or more . (6)
4. In idiopathic chronic or intractable diarrhea of infancy in developed world, lactose free protein hydrolysates are usually used in the 1st instance . These should be given in a volume and strength sufficient to meet both fluid requirement and energy and protein need for growth . (6,18)
5. Human milk and modular foods have also been used and prognosis depend largely on early institution of nutritional support and nature of underlying disease.(6,18)

Material and Methods

The hemoglobin level of 70 children who attended the central teaching hospital of the child their age were (2ms – 2 yrs.) were checking by aspiration of venous sample during 4 months period from 10th of January 2004 to 10th of may 2004.

The following questions were used including : Name, age, sex, type of feeding (breast, bottle, mixed) and any additional food.

Also any history of diarrhea (frequency, duration, recurrence, any associated illnesses (like respiratory tract infection)).

After that the children undergo full examination : Growth parameters – Length , weight, head circumference were recorded.

The Hb levels and pcv % levels recorded also.

We dived the children into two groups :-

1st group : those with chronic diarrhea (G.E) (40/70).

2nd group : control (30/70).

The Hb levels are comported between both groups.

Also compare growth parameters (weight, length, head circumference) between both groups.

Males were (40/70), female were (30/70), then do comparison of Hb level between males and females of the same group and with the other group.

After that we compare between both groups in relation to being breast fed, bottle – fed, mixed or with added food.

Those children who were very ill due to other illnesses, excluded from our study.

The children who visit the hospital for vaccination and were ill, excluded from our study.

We do comparison between both groups in relation to risk factors (single attack of G.E, recurrence, Associated illnesses).

Also we compare between both groups in relation to growth parameters (weight, length, O.F.C) & being above or below 3rd centile.

Table (1) Relation between Hb level with patient and control .

	Hb< 11	Hb≥ 11	Total No
Patient	28	12	40
control	6	24	30
Total N0	34	36	70

$X^2 = 17.16$ $p < 0.05$ Significant

Table (2) Relation between Hb level and the sex of patient with diarrhea .

Sex	Hb<11	Normal Hb≥ 11	Total No
Female	12	8	20
Male	16	4	20
Total No.	28	12	40

$X^2 = 1.902$ $P>0.05$ Not significant (N.S)

Table (3) Relation between Hb level and the sex of the control.

Sex	Hb< - 11	Hb≥ 11	Total No
Female	3	7	10
Male	3	17	20
Total No.	6	24	30

$X^2 = 0.937$ $p> 0.05$ (N.S)

Table (4) Relation between Hb level and the sex of the patient and control .

Sex	Anemic Hb < 11	Not Anemic Hb ≥ 11	Total No
Female	15	15	30
Male	19	21	40
Total No.	34	36	70

$X^2 = 0.04$ $p > 0.05$ (N.S)

Table (5) Relation between type of feeding and Patients and control .

	Breast feeding	Bottle feeding	Mixed	Added food
Patients	7	29	4	19
Control	13	12	5	21
Total	20	41	9	40

$X^2 = 8.511$ $p < 0.05$ Significant

Table (6) Relation between the risk factors and patient and control .

	Single attack	Recurrence	Associated Illnesses
Patients	18	22	27
Control	10	Zero	Zero
Tatal	28	22	27

$X^2 = 13.789$ $P < 0.05$ Significant

Table (7) Relation between patients and their weight, length head circumferences (O.F.C)

	Weight	Length	(O.F.C)
$<3^{rd}$ centile	21	12	10
$> 3^{rd}$ centile	19	28	30

$X^2 = 27.70$ $P< 0.05$ Significant

Table (8) Relation between control and their weight, length, (O.F.C)

	Weight	length	(O.F.C)
$< 3^{rd}$	3	1	1
$> = 3^{rd}$ centile	27	29	29

$X^2 = 1.697$ $P> 0.05$ (N.S)

The Results

Table No 1 : Show relation of Hb level between the patients and control its highly significant (there is relation ship) where the $x^2 = 17.16$, p value < 0.05, Dif. = 1 (Dif = Differnce) .

Table No 2 : Show relation between Hb level and the sex of the patients which show no significant relation ship where $x^2 = 1.902$, Dif = 1, p value > 0.05 .

Table No 3 : Show relation between Hb level and the sex of the control which show no significant relation ship where $x^2 = 0.93 >$,, Dif = 1, p value > 0.05 .

Table No 4 : Show relation between Hb level and the sex of thepatient and control which show no significant relation ship where $x^2 = 0.04$, Dif = 1, p value > 0.05 .

Table No 5 : Show relation between type of feeding and condition of the patients and control which show significant relation ship where $x^2 = 8.511$, Dif = 3, p value < 0.05 .

Table No 6 : Show relation between the risk factors and control and Patients which show significant relation ship where $x^2 = 13.789$, Dif = 2, p value < 0.05 .

Table No 7 : Show relation between patients, control and their growth parameters (weight, length , o.f.c) which show significant relation ship where $x^2 = 27.7$, Dif = 2, p value < 0.05 .

Table No 8 : Show relation between control and their growth parameters (weight , length , o.f.c) which show no significant relation ship where $x^2 = 1.697$ Dif = 2, p value > 0.05 .

Discussion

Patient with persist ant (chronic) diarrhea likely to be deficit in vitamins (iron) minerals, those of particular importance because of their role in renewal repair of intestinal mucosa (21).

1- In our study we found in table (1) that chronic diarrhea can affect Hb level and cause iron deficiency anemia because each attack can lead to more malnutrition and malabsorption and this agreed with study done by B.R. Thapai (division of pediatric gastroenterology) (22).
2- According to table (2), table (3), table (4), we found that there is no relation between sex of the patient (with or without diarrhea and Hb level).
3- According to table (5) there strong relationship between type of feeding and diarrhea, where breast fed, babies have few and less sever episodes of diarrhea then those who are not breast fed babies, and have best chance of survival and good health and this agreed with study done by S.S.F Leung, Mbb, Md, FRCP, C.X peng (23,24).
4- According to table (6) there strong relationship between chronic diarrhea and history of recurrent brief attacks of gastroenteritis, also history of associated illnesses, because each attacks cause more loss of vitamins A.A.12, Foliate, minerals like iron and zinc and loss of nutrients and all are important for normal immunologic response and this agreed with study done by B.R Thapa (22).
5- According to table (7) and (8), chronic diarrhea can affect the growth, where each episode of diarrhea, contributes to malnutrition, mainly on the weight, then when prolong on the length and lastly on o.f.c, where the last two need long time to be affected, this agreed with study done by National center for health statistics (20).

Conclusions

1- There is relationship between chronic diarrhea and reduced Hb level (iron deficiency anemia) , where patient with chronic diarrhea will be more liable to develop iron deficiency anemia than others without chronic diarrhea.

2- Chronic diarrhea will affect weight of the body where we found that child with chronic diarrhea more liable to have low weight in comparison to healthy child.

3- Chronic diarrhea can even affect length of the child, where child with chronic diarrhea will be shorter than others healthy child.

4- Large number of child with chronic diarrhea are bottle fed, so they will be liable for recurrent diarrhea due to poor hygiene, while large number of healthy child included into our study were breast feed which is the best method for prevention of diarrhea and its squale.

Recommendation

1.Protection from gastroenteritis can be achieved by close attention to hygienic measures in the preparation of foods & maintaining high standard of a hygiene generally.(6).
2.In the hospital ,nursery strict observance of measures to prevent cross infection is necessary because the disease once it has occurred ,can spread very rapidly.
3.Strict isolation of cases & of contacts & carrier nursing are necessary in & world.(6).
4.Breast feeding is an important preventive measure encourage exclusive breast feeding for the 1st 4-6 months & continue for at least 1st 2 years of life.(22).
5.Oral vaccine against Rota viruses are now available & they are given in three doses ,they are safe & effective.(6).
6.Added food is very important especially after 6 months of age, & it should be rich in iron supplements ,because iron rich food sources is important in prevention & treatment of iron deficiency anemia before & after onset of diarrhea where the baby will be depleted of iron & & malnourished especially after chronic gasroenteritis.(12).
7.Unnecessary inhibitors of absorption should be avoided such as those in tea ,coffee & fiber.(12).
8.Immunization against measles & other diseases.(22).

References

1.The chemical basis of life ,General, organic & biological chemistry for the health sciences . The inter relationships & controls of metabolism ,summary & conclusion. George H.Schmid , PhD Hemoglobin: 825..

2. Nelson textbook of pediatrics ,Richard E ,Behrman M.D.17th edition: 2004 Iron deficiency anemia : 1614-1615, Gastroenteritis : 1272-1281.

3.Rypins :Basic sciences review,17th edition ,Edward D.Frohlich ,Editor. Anemia's :554 ,Small & large Intestine : 571.

4.Current pediatrics , Diagnosis & treatment ,C.Henry Kemp ,Henery K . Silver Don digh .O'brien. 11th edition. Anemias : 375.

5.Harrison's principles of internal medicine,15th edition ,2001 . Chronic diarrhea : 198 , Iron deficiency anemia : 662-664.

6.Forfar & Arneils textbook of pediatrics , 5th edition 1998. Iron : 1201 ,Gastroenteritis : 1215-1295.

7.Textbook of medical physiology , Arthur C. Gyton M.D.Johne.Hall PhD .Iron transport & metabolism : 430-431.

8.Clinical hematology , Max well M.Wintrobe , G.Richard 7th edition. Iron & Iron deficiency anemia : 648.

9.Review of medical physiology , W.F.Ganong 11th edition ,Middle east edition. Iron : 385, Diarrhea : 421.

10. De.Gruchy's clinical hematology in medical prebake, 5th edition. Iron deficiency anemia.

11.Clinical gastroenterology edited by L.A Turnborg ,Blackwell scientific publications. General nutritional deficiency : 378.

12.Copy right 2001 by Page wise. Iron deficiency anemia in infants & children.

13.Gastroenterology , management of common diseases in family practice , series editors J.Fry & M.JLan Caster smith & C.Chapmen.

Anemia, chronic diarrhea : 93.
14.Davidson's ,principles & practice of medicine ,edited by John Macleod ,Christphan Edward, IAN Bonchier 18th edition,1999. Anemia :749.
15.Hutchison's clinical method ,Michael Sash ,MDFFCP ,FRC Path ,1997. Diarrhea :75.
16.Manual of Gastroenterology ,Diagnosis & therapy. Malabsorption :150.
17.General pathology , J.B.Walter M.S.Israel ,6th edition . Disorders of nutrition ,mineral absorption :477.
18.Primary care medicine ,Dale Berg M.D Laura Cantwell M.D ,Gustavo Hendebert M.D ,features of chronic diarrhea syndrome ,clinical features & diagnostic test & treatment :92.
19.Tanner J.M. ,white house R.H. Growth & development chart,1975,published by Castle mead publication.
20.National center for health statistics NCHS Growth charts. Rockville ,MD ; US Depth of health ,Education & welfare ;1976. HRA 76-1120 ,25(3).
21.Reading on diarrhea ,students manual(World Health Organization Geneva) 1992.
22.Intractable diarrhea ,Journal of tropical pediatrics ,Oxford university ,press ,vol.40 , No.3 page:157.
23.Journal of tropical pediatrics ,Oxford university press. Induced lactation vol.40, No 4 ,August 1994 ,page : 242.
24.Journal of tropical pediatrics ,Oxford university press vol.40 No.3 ,June 1994 ,page :166 ,comparative study of Growth of Chinese infants.

((Formula of study))

Name of the patient:

Age: ,sex

Weight :

Length :

O.F.C.

Feeding :

Added foods :

Associted illnesses :

Duration of diarrhea:

Frequency :

Recurrence

Hb %

PCV:

blood film:

الخلاصة العربية

دراسة أجريت في مستشفى الطفل المركزي تضمنت ٧٠ طفلا اعمارهم تتراوح ما بين شـــهران ـ سنتـــان من بين هؤلاء الاطفال ٤٠ طفلا ادخلوا الى المستشفة لاصابتهم بالاسهال لأكثر من اسبوعين و ٣٠ طفلا زارو المستـــشفى لغرض التلقيح .

أجريت لهم تحليل : نسبة الهيموغلوبين ، PCV ، وكذلك الطول والوزن ومحيط الرأس كذلك أخذت معلومات عن اصابـــات سابقة بالاسهال ، تكرار الاصابة ، اي مرض آخر ، نوع االتغذية الاطعمة المضافة ، لنرى هل هنالك علاقة بين الاسهال المزمن وفقـــر الدم وعلاقتهما بمقاييس النمـــو .

العدد الكلي للمرضى : (٧٠) عدد الذكور (٤٠) عدد الاناث (٣٠) .أظهرت الدراســات ام ٧٠٪ من المرضى المصابـــون بالاســهال كانوا مصابـــون بفقـــر الدم ونسبـــة الهيموغلوبـــين (٧ ـ ١١) كذلك (٢٢,٥ ٪) من المرضى بالأسـهال كانوا يعتمدون على الرضاعة الاصطناعية (١٠٪) رضاعة مختلطة (اصطناعية + طبيعية) ، بينما (٤٣,٣ ٪) من الاطفال الذين لم يصابـوا بالاسـهال كانوا على الرضاعة الطبـيعية ، (١٦,٦ ٪) رضاعة مختلطة اضافة الى اعلاه (٢٥٪) من المرضى بالاسـهال كانوا اقـل من (3rd centile) في كل مقاييس النمو .

في هذه الدراسة استثنينا الاطفال دون الشهرين من العمر لاحتمال وجود اضطرابات الايض الولادية سببا للاســـــهال المزمن .